1969 OPERATING SUMMARY

SIMCOE

water pollution control plant

ONTARIO WATER RESOURCES COMMISSION
Division of Plant Operations

Water management in Ontario

Ontario
Water Resources
Commission

135 St. Clair Ave. W.
Toronto 195
Ontario

The operating efficiency and financial status of the water pollution control facilities operated for you in 1969 are presented in the following pages.

The regional operations engineer's comments and the statistical data will assist you in gauging the plant's level of performance. A new flow chart and up-to-date design data are also provided.

Various divisions and sections within the Commission have co-operated in providing what we trust is an accurate and concise annual operating summary.

D.S. Caverly,
General Manager.

D. A. McTavish, P. Eng.,
Director,
Division of Plant Operations.

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SIMCOE

water pollution control plant

operated for

THE TOWN OF SIMCOE

by the

ONTARIO WATER RESOURCES COMMISSION

1969 ANNUAL OPERATING SUMMARY

DESIGN DATA

PROJECT NO.	2-0120-62	TREATMENT	Activated Sludge
DESIGN FLOW	2.0 mgd	DESIGN POPULATION	15,400
BOD - Raw Sewage	220 mg/l	SS - Raw Sewage	230 mg/l
- Removal	90%	- Removal	90%

RAW SEWAGE PUMPS

a) Type: Fairbanks-Morse
Size: One 1200 gpm @ 35' tdh

b) Type: Smart-Turner
Size: One 500 gpm @ 35' tdh

c) Type: Worthington
Size: Two 2000 gpm @ 50' tdh

PRETREATMENT (Common)

Grit Removal

Type: Dorr Detritor
Size: One 14' x 14' x 1½' (1,850 gal)
Retention: 1.33 min

Comminution

Type: Barminutor
Size: Model "C" (24")

PLANT #1 (0.6 mgd)

PRIMARY TREATMENT

Primary Sedimentation

Type: Hardinge
Size: One 50' x 20' x 8' (50,000 gal)
Retention: 4.31 hr
Loading: Surface, 600 gal/ft^2/day
Weir, 30,000 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air, Four pass
Size: 8 - 12' x 50' x 8' (240,000 gal)
Retention: 9.6 hr

Diffusers

Type: Holes in pipe & spargers

Air Supply

Type: Roots-Connersville
Size: Two 1200 scfm

Secondary Sedimentation

Type: Dorr
Size: One 46' (hex) x 9½' swd (98,600 gal)
Retention: 3.16 @ design flow with 25% return sludge
Loading: Surface, 360 gal/ft^2/day
Weir, 4150 gal/ft/day

CHLORINATION

Type: W & T
Size: One 400 lb/day

Chlorine Contact Chamber

Size: One 18' x 14¼' x 6' (6,800 gal)
Retention: 16.4 min

PLANT #2 (1.4 mgd)

PRIMARY TREATMENT

Primary Sedimentation

Type: Dorr
Size: Two 45' dia x 10' swd (198,000 gal)
Retention: 3.4 hr
Loading: Surface, 440 gal/ft^2/day
Weir, 5570 gal/ft/day

SECONDARY TREATMENT

Aeration Tanks

Type: Diffused air; single-pass
Size: Two 98' x 25' x 12½' (369,150 gal)
Retention: 6.3 hr

Diffusers

Type: Inka

Air Supply

Type: Dorr
Size: Two 5508 scfm

Secondary Sedimentation

Type: Dorr
Size: Two 45' dia x 10' swd (198,000 gal)
Retention: 3.4 hr
Loading: Surface, 440 gal/ft^2/day
Weir, 5570 gal/ft/day

CHLORINATION

Chlorine Contact Chamber

Size: 15' x 20.6' x 8.2' (15,700 gal)
Retention: 16 min

OUTFALL (Common)

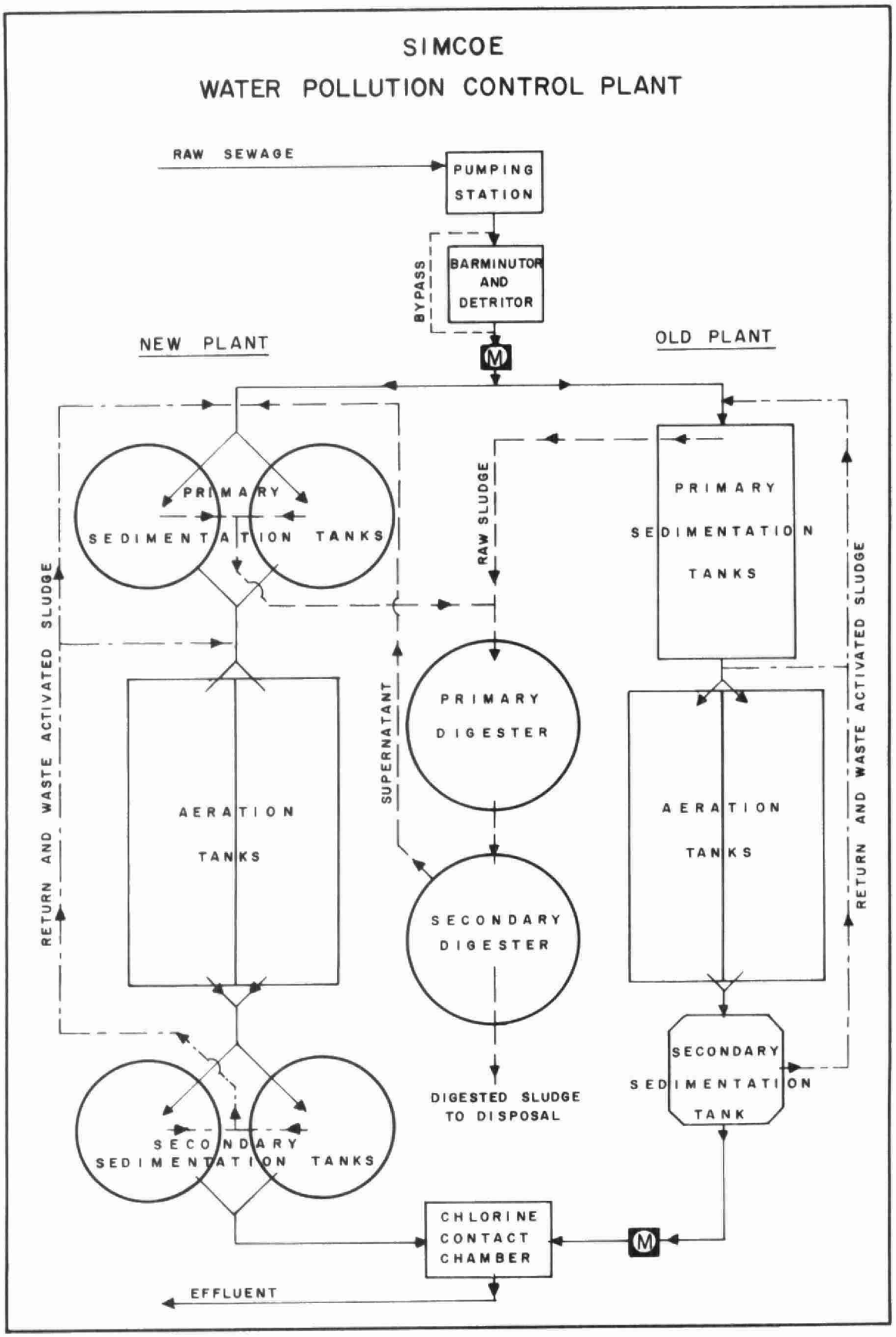
- to Lynn River

SLUDGE HANDLING (Common)

Digestion System - two-stage

Primary --
Type: PFT; gas mixed (Pearth floating cover)
Size: One 50' dia x 20' swd (43,250 cu ft or 270,000 gal)
Loading: 2.86 lb/cu ft/mo

Secondary --
Type: PFT
Size: One 50' dia x 20' swd (43,250 cu ft or 270,000 gal)
Total Loading: 1.43 lb/cu ft/mo


SIMCOE
WATER POLLUTION CONTROL PLANT
RAW SEWAGE
PUMPING STATION
BYPASS
BARMINUTOR AND DETRITOR
NEW PLANT
OLD PLANT
M
PRIMARY SEDIMENTATION TANKS
RAW SLUDGE
PRIMARY SEDIMENTATION TANKS
RETURN AND WASTE ACTIVATED SLUDGE
AERATION TANKS
SUPERNATANT
PRIMARY DIGESTER
AERATION TANKS
RETURN AND WASTE ACTIVATED SLUDGE
SECONDARY DIGESTER
SECONDARY SEDIMENTATION TANK
DIGESTED SLUDGE TO DISPOSAL
SECONDARY SEDIMENTATION TANKS
CHLORINE CONTACT CHAMBER
M
EFFLUENT

'69 REVIEW

GENERAL

This project is composed essentially of two separate activated sludge treatment plants which share common raw sewage pumping, effluent works, digestion and chlorination facilities. One plant of 0.6 mgd capacity was put in operation in 1956, and the second plant, of 1.4 mgd capacity, was started up in August, 1963. The old plant is operated by the OWRC, but is not a Commission-financed plant. The aeration section of the new plant is equipped with an Inka diffusion system.

During 1969, the number of accidental industrial waste spills increased, causing operation problems. The Town is now drafting a sewer-use by-law that should reduce shock loading from local industries when enforced.

EXPENDITURE

The total operating cost of 1969 was $50,722.79 as opposed to $46,216.84 in 1968. There was a decrease in the total flow to the plant from the 654.82 million gallons treated in 1968 to 627.50 million gallons. (It should be noted, however, that due to a meter failure flows were estimated for a two-month period.) These factors resulted in an increase in cost per million gallons to $78.38 from 1968's $70.58. The five-year average cost per million gallons is $70.57.

PLANT FLOWS and CHLORINATION

Old Plant

Of the total raw sewage flow, 153.2 million gallons or 24.6% was diverted to the old plant by a flow splitter. The maximum flow treated was 0.84 mil. gal. on one day in November. The minimum day flow of 0.32 mil. gal. occurred in October. The average flow through the old plant was 0.50 mgd for a load factor of 0.83.

New Plant

Of the total raw sewage flow, 491.4 mg or 75.4% was directed to the new plant. The maximum flow treated in any day was 3.51 mil. gal. and the minimum in one day was 0.84 mil. gal. The average flow was 1.30 mgd for a load factor of 0.93.

Combined System

The total flow treated in 1969 was 647.5 mil. gal., for an average of 1.8 mgd. This represents a load factor of 0.90 on the entire complex, based on design flows. The maximum flow recorded on any one day was 3.51 mil. gal., or less than twice design. The minimum flow recorded for one day was 1.04 mil. gal. The probability graph shows that flows exceeded design about 13% of the time.

A total of 9,840 lbs. of chlorine was used from April to October at an average dosage of 3.0 milligrams per litre to maintain the required residual of 0.5 mg/l in the combined effluent of the two plants.

PLANT EFFICIENCY

Old Plant

The raw sewage samples collected for this plant showed an average concentration of 231 mg/l BOD and 196 mg/l suspended solids. The average effluent values of 10 mg/l BOD and 12 mg/l suspended solids were slightly higher than the 1968 values. The removal efficiencies were 96% for BOD and 94% for suspended solids.

New Plant

The samples collected for this plant showed an average organic loading of 229 mg/l BOD and 194 mg/l suspended solids in the raw sewage. The average effluent values of 18 and 16 mg/l are higher than normal due to occasional industrial waste spills which upset the quality of the final effluent. There is a slight decrease in the efficiency of the plant from the 1968 values of 94% for BOD and 93% for suspended solids; during 1969, the removal efficiencies for both BOD and suspended solids were 92%.

COMMON SLUDGE DIGESTION and DISPOSAL

A total of 3,730,000 gallons of raw sludge was pumped to the digester in 1969 as opposed to 4,251,000 gallons in 1968. This decrease of 14% can be partly accounted for by the slight decrease in hydraulic loading. A total of 1,890,000 gallons of digested sludge or 51% of the original sludge volume was disposed of in the town-operated sludge drying beds adjacent to the plant.

No sludge was hauled by truck at this project. The volatile content of the sludge was reduced by 45%, while the gas produced in the digester was used in the plant boiler for heating, and the excess burned as a waste product.

Common Grit Removal

The grit removal from the total sewage flow to both plants averaged 43 cubic feet per month as compared to 42 cubic feet in 1968. This represents a removal of 0.84 cubic feet per million gallons of sewage, and can be considered lower than normal.

AERATION

Old Plant

The average BOD and suspended solids of the primary effluent to the aeration section was 183 mg/l and 116 mg/l in No. 1 plant, giving primary removal efficiencies of 20.8 and 40.8 respectively. This is lower than normal due to the recirculation of supernatant back to the primary section. The 1968 values were 202 and 133 mg/l. The average MLSS value of 2470 mg/l was lower than the 1968 value of 2795 mg/l and resulted in an average loading of 0.17 lbs. of BOD per lb. of MLSS.

An average of 3220 cubic feet of air was supplied per lb. of BOD removed. The air supplied is much greater than in other secondary plants.

New Plant

The average BOD and suspended solids in the primary effluent to the aeration section was 217 mg/l and 140 mg/l in No. 2 plant, giving removal efficiencies of 5.6% and 27.8%. This was lower than the old plant due to a higher proportion of supernatant being re-circulated back to this plant. The 1968 values were 211 and 177 mg/l.

The average MLSS value of 2520 mg/l was lower than the 1968 value of 2870 mg/l, and the F/M ratio of 0.31 compares with the 1968 value of 0.29 lbs. of BOD per lb. of MLSS. An average of 5400 cubic feet of air was supplied per lb. of BOD removed. The air required of the Inka system is considerably higher than for a conventional system. However, pressures are much lower.

CONCLUSIONS

During 1969, the combined plant at Simcoe operated efficiently and produced an effluent which met OWRC objectives 87% of the time.

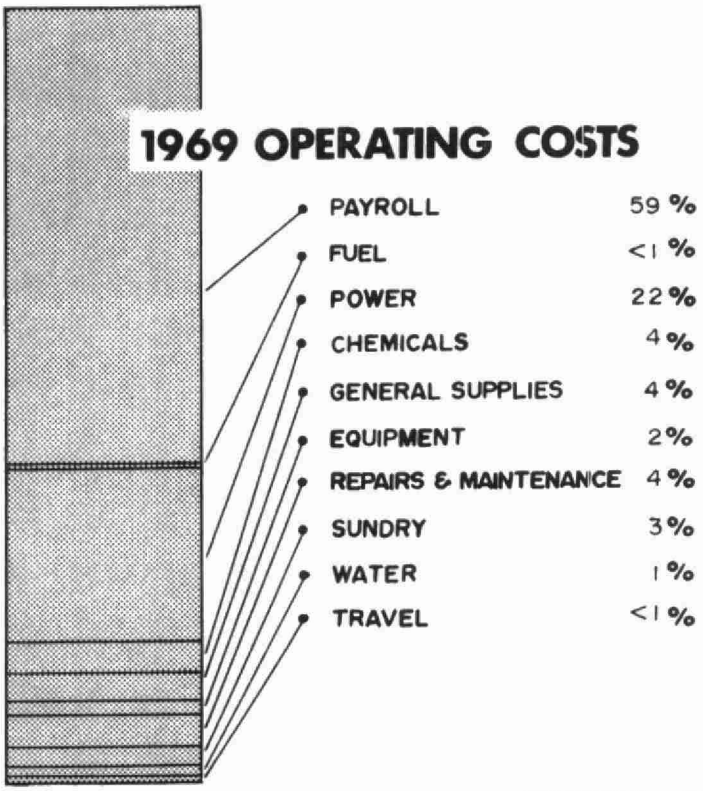
Because of the high loading and possible future expansion of the area, the firm of Proctor and Redfern was retained to prepare a preliminary report on plant expansion requirements. The report is due in March, 1970.

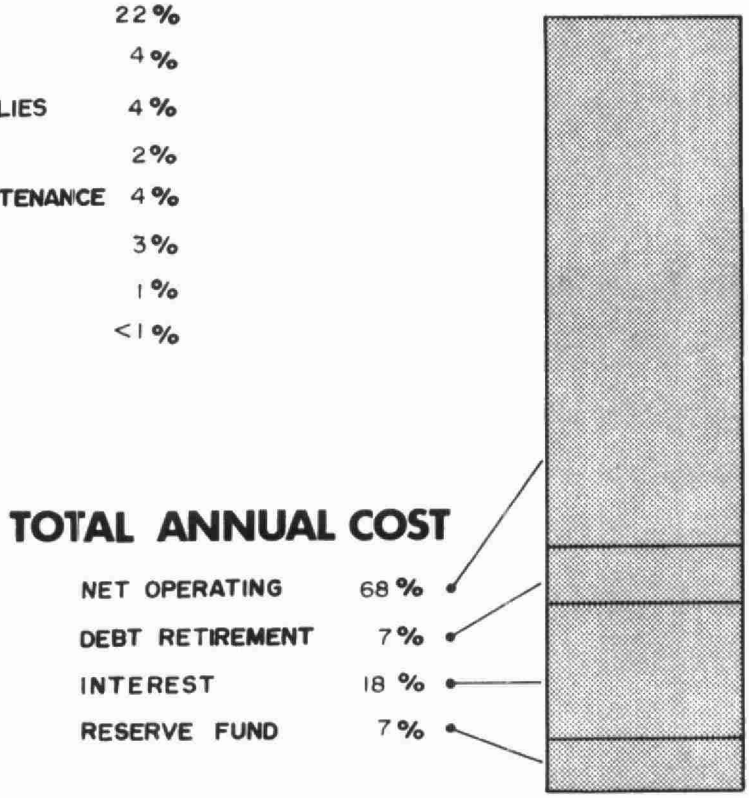
PROJECT COSTS

NET CAPITAL COST (Final)		$694,205.44
DEDUCT - Payments from Municipality	$ 37,795.29	
- Portion financed by CMHC/MDLB (Final)	409,699.75	447,495.04
Long Term Debt to OWRC		$246,710.40
Debt Retirement Balance at Credit (Sinking Fund) December 31, 1969		$ 39,396.46
Net Operating		$ 50,722.79
Debt Retirement		4,979.00
Reserve		5,274.82
Interest Charged		13,812.05
TOTAL		$ 74,788.66

RESERVE ACCOUNT

Balance @ January 1, 1969	$ 31,511.99
Deposited by Municipality	5,274.82
Interest Earned	1,909.45
	$ 38,696.26
Less Expenditures	-
Balance @ December 31, 1969	$ 38,696.26





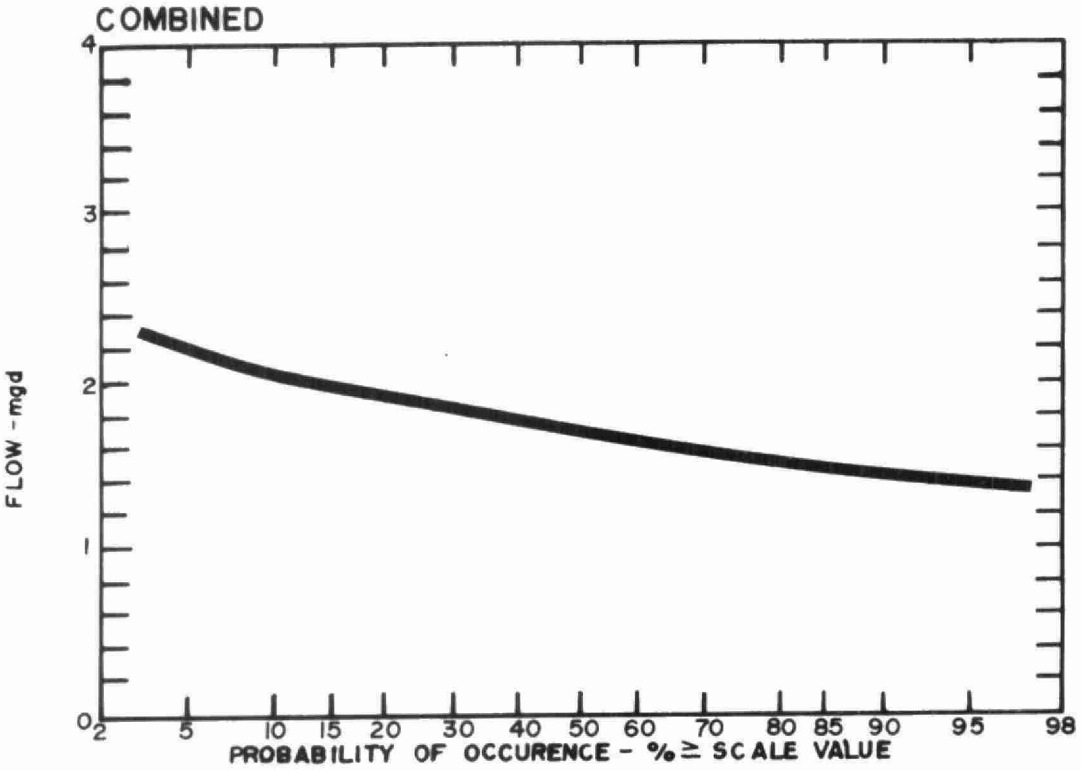
Yearly Operating Costs

YEAR	MILLION GALLONS TREATED	TOTAL OPERATING COSTS	COST PER MILLION GAL	COST PER LB OF BOD REMOVED
1965	565.53	$40,334.44	$71.32	2 cents
1966	628.39	42,874.24	68.23	3 cents
1967	621.10	45,987.82	74.04	3 cents
1968	654.82	46,216.84	70.58	3 cents
1969	627.50	50,722.79	80.83	3 cents

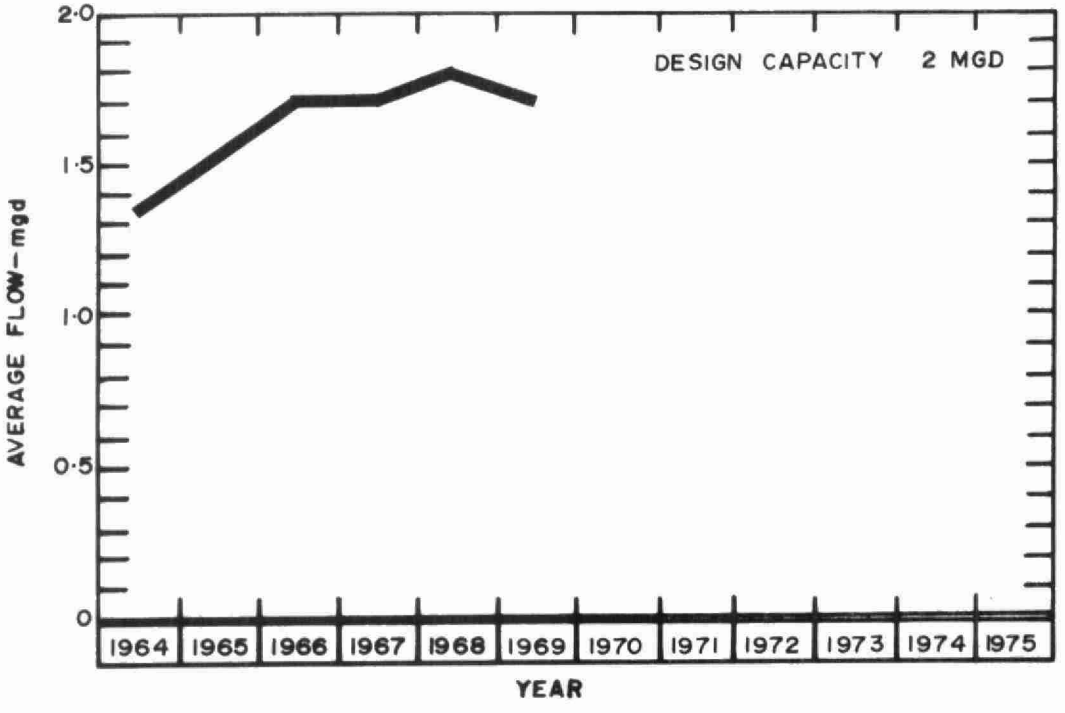
Monthly Operating Costs

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICALS	GENERAL SUPPLIES	EQUIPMENT	REPAIRS and MAINTENANCE	SUNDRY	WATER	TRAVEL
JAN	3313.73	3149.93	-	-	-	-	16.20	-	89.67	42.78	-	15.15
FEB	4421.54	2692.54	-	177.75	976.00	119.31	135.84	-	215.85	15.70	58.25	30.30
MAR	3887.86	2174.12	-	145.38	618.00	-	143.40	473.05	168.00	80.81	58.25	26.85
APR	3242.36	2288.47	-	-	692.80	-	100.86	-	40.24	48.99	58.25	12.75
MAY	4352.39	2427.88	-	-	1016.40	353.13	127.27	19.64	196.67	114.15	58.25	39.00
JUNE	3640.11	2167.84	-	-	830.40	207.11	131.22	-	205.25	3.59	58.25	36.45
JULY	3810.12	2215.75	60.66	-	794.80	330.75	171.05	-	125.70	41.31	58.25	11.85
AUG	4333.48	3214.20	-	-	830.00	22.67	75.91	84.71	13.56	21.73	58.25	12.45
SEPT	4026.48	2178.48	-	-	1025.60	330.75	88.25	149.62	138.13	21.10	58.25	36.30
OCT	3714.75	2149.51	-	-	781.70	176.40	204.87	-	214.21	21.21	58.25	108.60
NOV	3897.93	2166.68	-	-	1251.95	209.62	79.99	-	25.83	77.86	58.25	27.75
DEC	8082.04	3026.37	-	13.35	2307.70	247.30	537.81	245.98	716.48	814.15	116.50	56.40
TOTAL	50722.79	29851.77	60.66	336.48	11125.35	1997.04	1812.67	973.00	2149.59	1303.38	699.00	413.85

PROCESS DATA


COMBINED
FLOW - mgd
0
1
2
3
4
2
5
10
15
20
30
40
50
60
70
80
85
90
95
98
PROBABILITY OF OCCURENCE - % ≥ SCALE VALUE

FLOWS


DESIGN CAPACITY 2 MGD
AVERAGE FLOW - mgd
0
0·5
1·0
1·5
2·0
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
YEAR

PLANT FLOWS and CHLORINATION

COMBINED

MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal	CHLORINE USED 10^3 pounds	DOSAGE mg/l
JAN	51.5	1.66	2.84	1.41	0	0
FEB	49.4	1.76	3.51	1.41	0	0
MAR	52.2	1.69	2.10	1.39	0	0
APR	63.8	2.12	2.73	1.67	.96*	2.8
MAY	59.1	1.90	2.47	1.55	1.86	3.2
JUNE	53.8	1.79	2.00	1.62	1.49	2.8
JULY	51.5	1.66	1.81	1.31	1.28	4.1
AUG	48.9	1.58	1.67	1.37	1.78	3.6
SEPT	54.4	1.71	1.88	1.04	1.65	3.2
OCT	52.9	1.70	1.99	1.29	.82*	3.2
NOV	55.1	1.83	2.31	1.41	0	0
DEC	54.9	1.77	2.08	1.38	0	0
TOTAL	647.5	-	-	-	9.84	-
AVERAGE	-	1.8	-	-	1.64	3.2

*Chlorination practiced between April 15 and October 9.

PLANT FLOWS and CHLORINATION

OLD PLANT (No. 1)

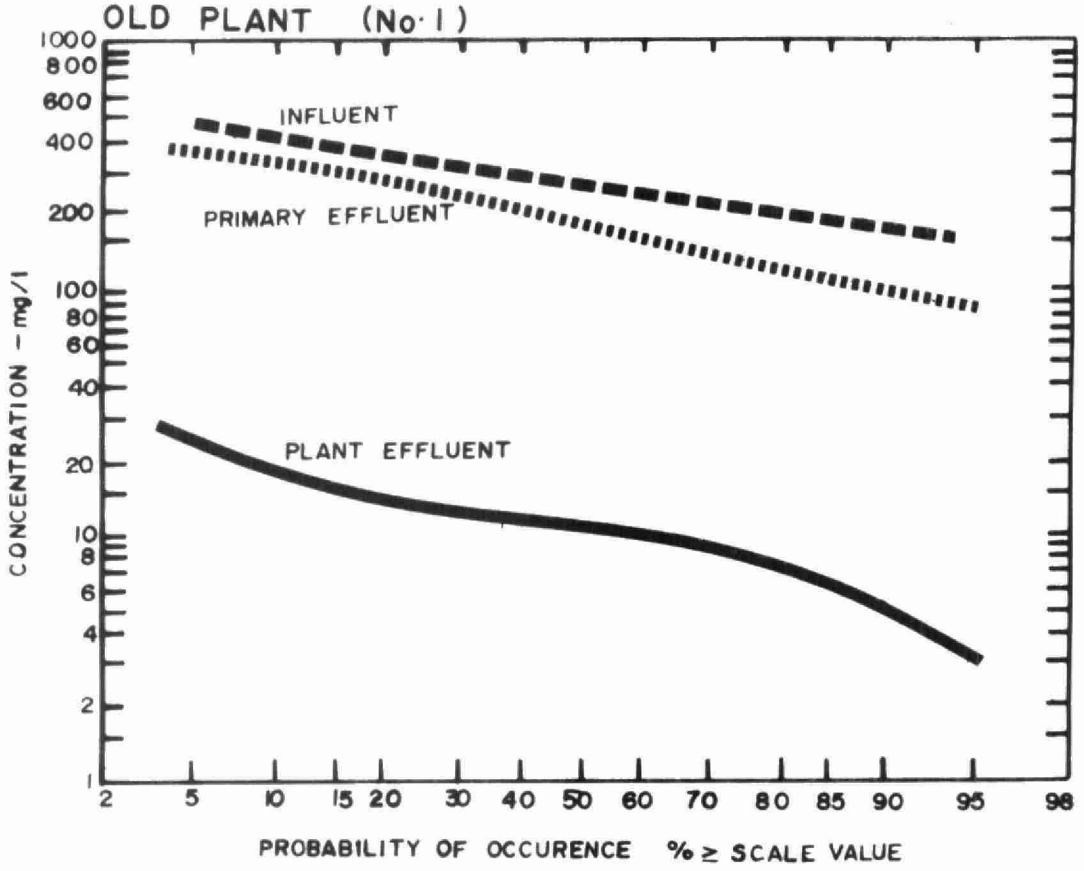
MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal
JAN	-	-	-	-
FEB	-	-	-	-
MAR	9.4*	.47	.55	.34
APR	15.0	.50	.61	.38
MAY	15.4	.50	.76	.34
JUNE	16.4	.54	.63	.38
JULY	16.6	.53	.60	.45
AUG	15.4	.50	.65	.37
SEPT	16.5	.55	.64	.47
OCT	15.5	.50	.63	.32
NOV	17.0	.56	.84	.34
DEC	16.0	.51	.71	.38
TOTAL	153.2	-	-	-
AVERAGE	-	.50	-	-

* In operation March 11

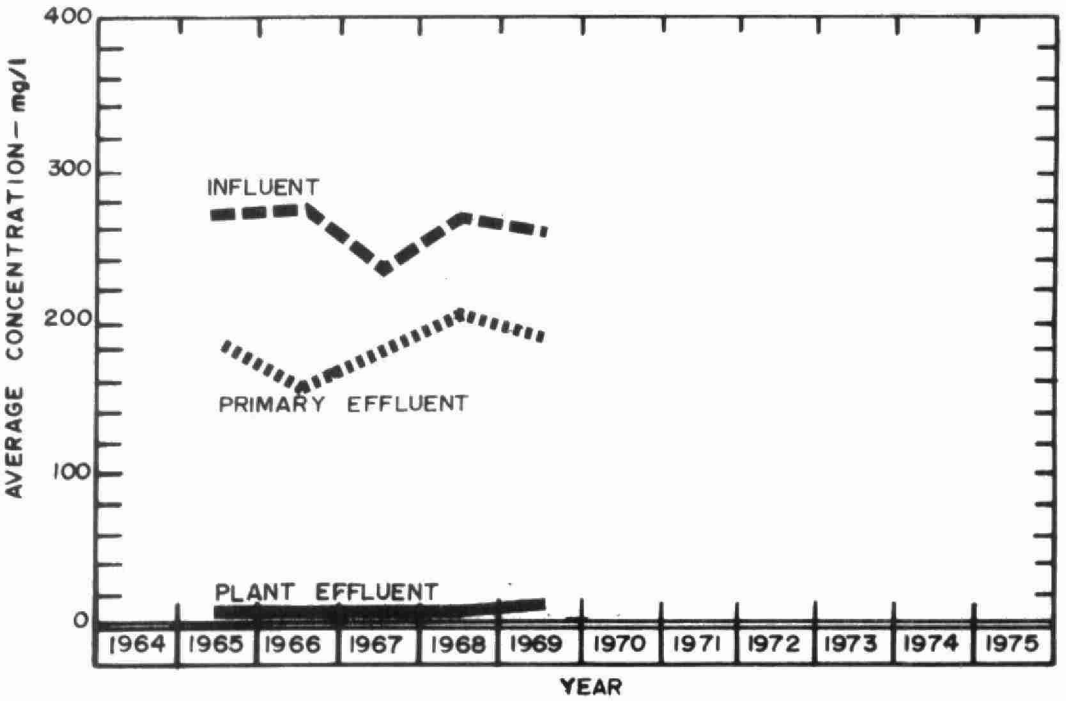
PLANT FLOWS and CHLORINATION

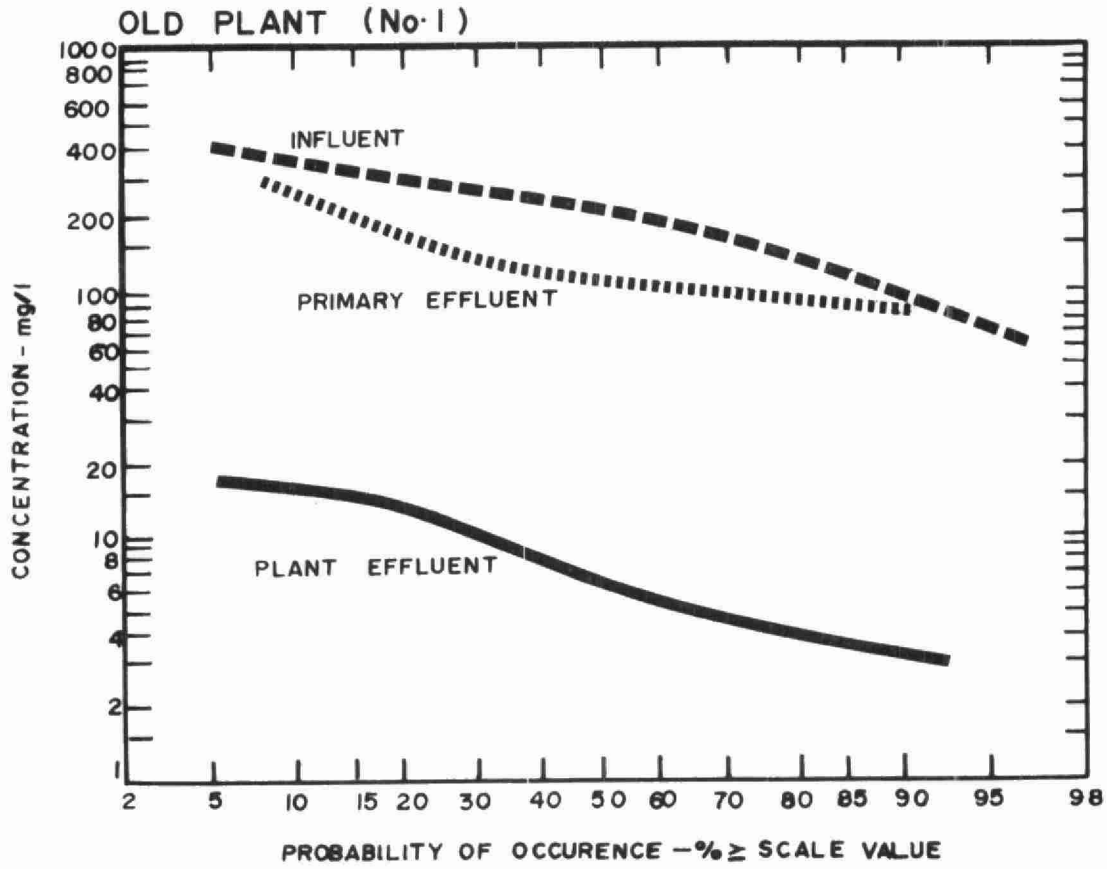
NEW PLANT (No. 2)

MONTH	TOTAL FLOW mil gal	AVERAGE DAILY FLOW mil gal	MAXIMUM DAILY FLOW mil gal	MINIMUM DAILY FLOW mil gal
JAN	51.5	1.66	2.84	1.41
FEB	49.4	1.76	3.51	1.41
MAR	42.9	1.38	1.84	1.05
APR	48.8	1.62	2.20	1.28
MAY	43.6	1.41	1.76	1.09
JUNE	37.4	1.25	1.43	1.14
JULY	35.0	1.13	1.26	.84
AUG	33.5	1.08	1.17	.93
SEPT	34.9	1.16	1.36	.90
OCT	37.4	1.20	1.41	.89
NOV	38.1	1.27	1.63	.94
DEC	38.9	1.25	1.53	.98
TOTAL	491.4	-	-	-
AVERAGE	-	1.30	-	-

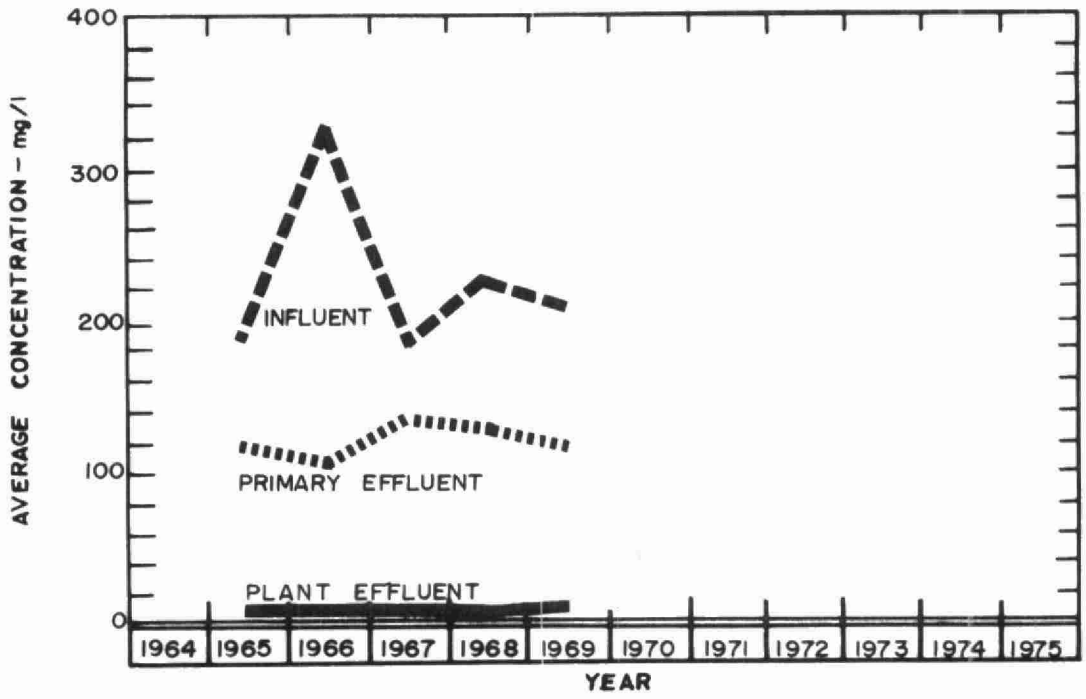


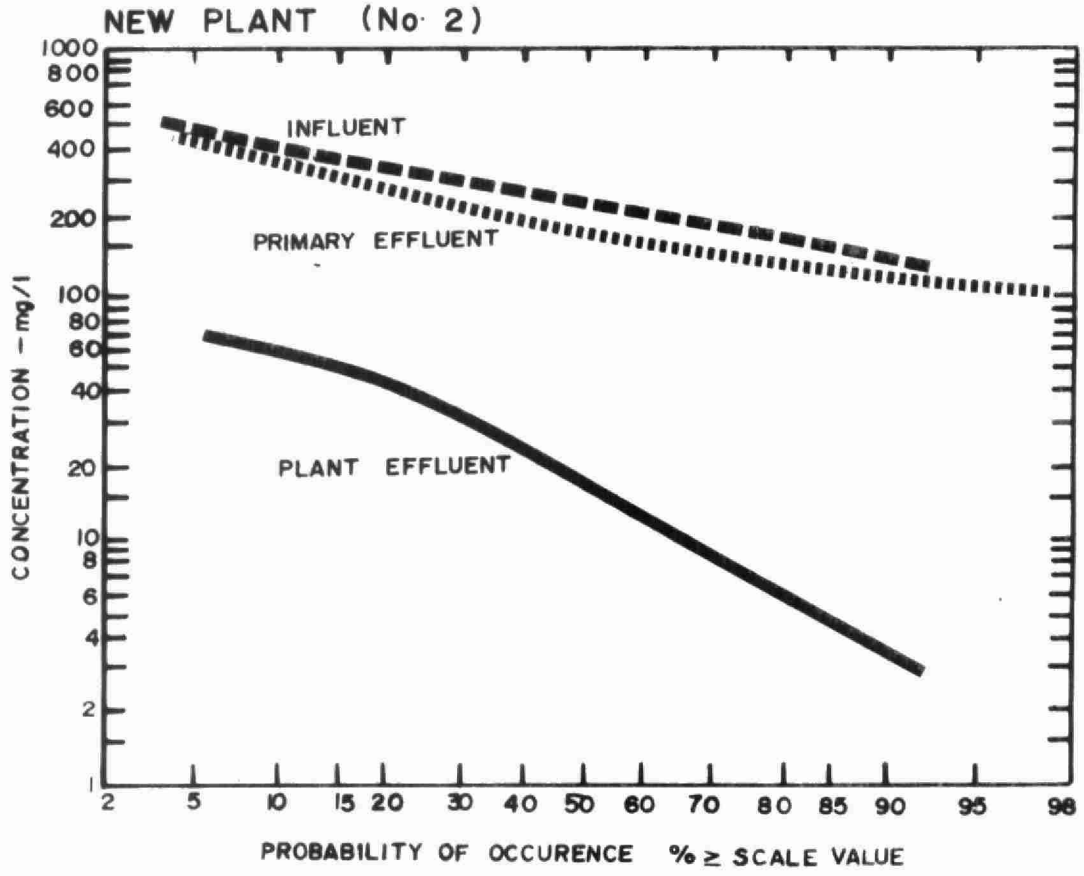
BIOCHEMICAL OXYGEN DEMAND



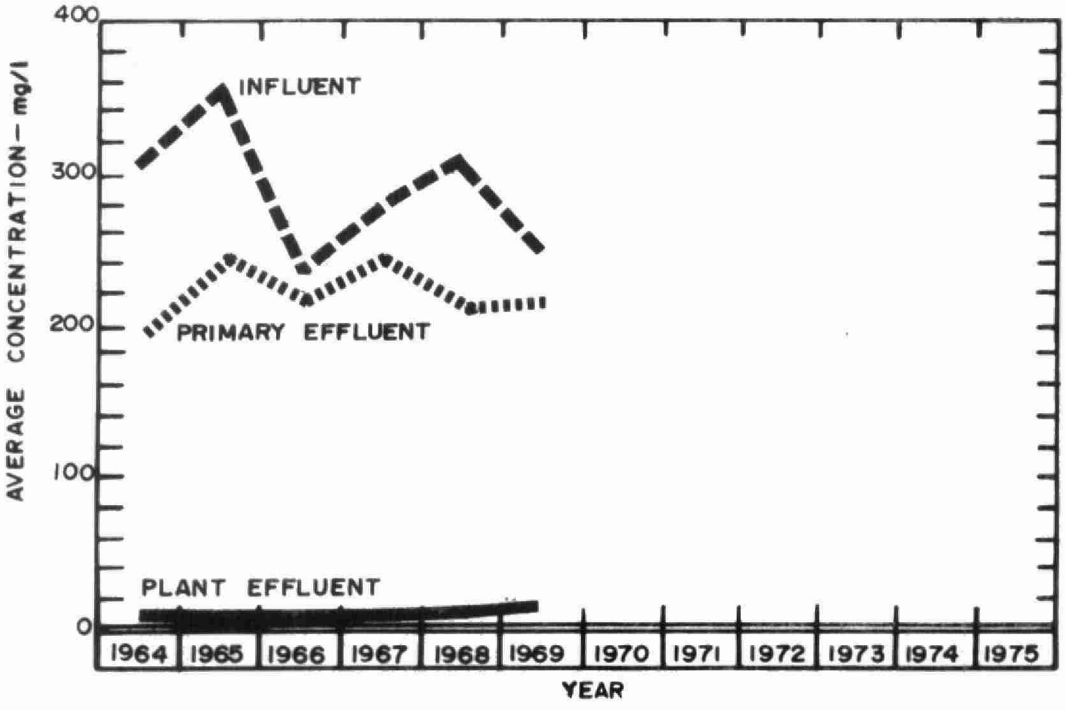


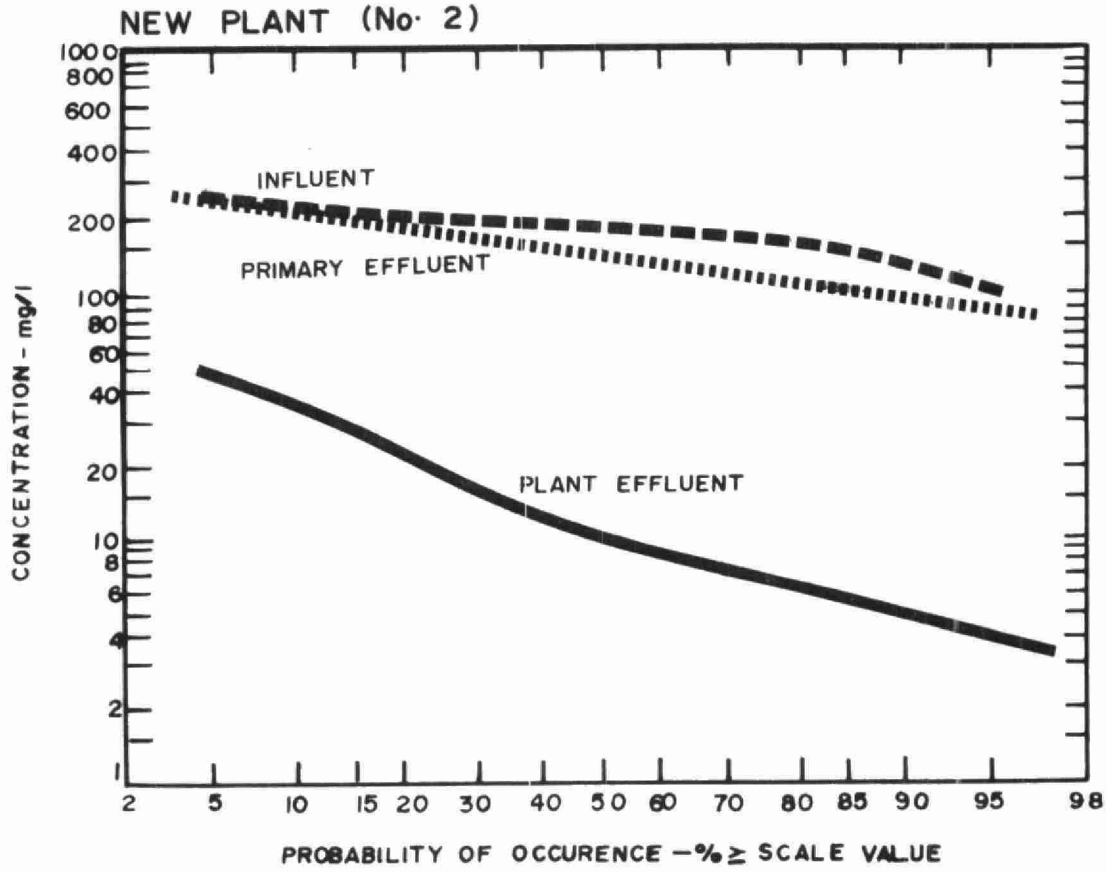
SUSPENDED SOLIDS



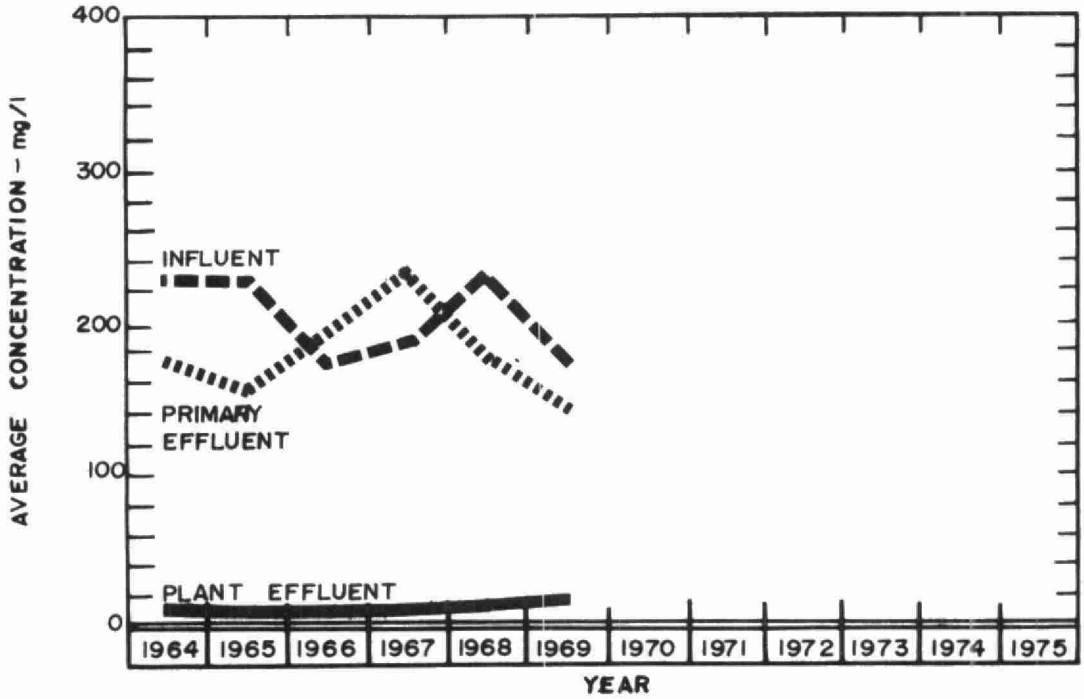


BIOCHEMICAL OXYGEN DEMAND





SUSPENDED SOLIDS



PLANT EFFICIENCY

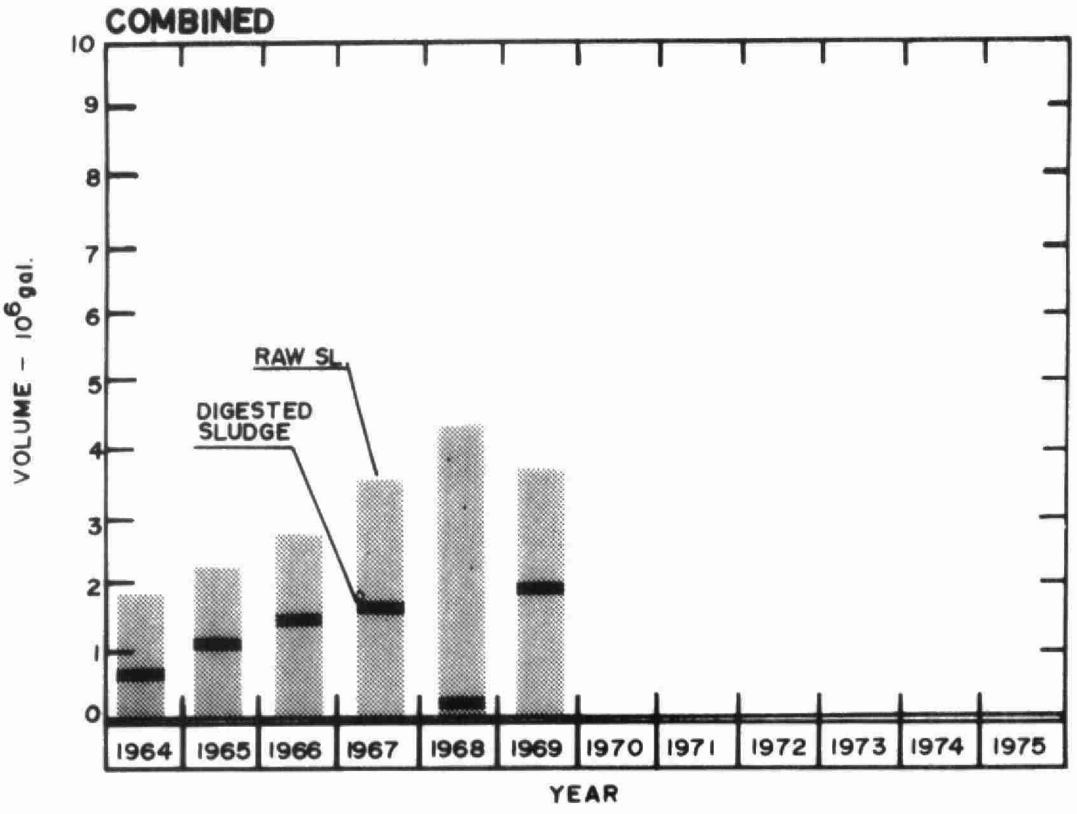
OLD PLANT (No. 1)

MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT REMOVAL
	INF.	EFF.	REDUCTION		INF. CONCN	EFF. CONCN	REDUCTION		
	mg/l	mg/l	%	10^3 pounds	mg/l	mg/l	%	10^3 pounds	cu ft
JAN		Out	of	Operation		Out	of	Operation	37
FEB		Out	of	Operation		Out	of	Operation	34
MAR		Out	of	Operation		Out	of	Operation	44
APR	243	10	96	34.9	192	16	92	25.4	47
MAY	190	14	93	27.1	149	18	88	20.2	41
JUNE	170	-	-	-	164	-	-	-	57
JULY	223	5	98	36.2	195	8	96	31.1	29
AUG	170	-	-	-	154	-	-	-	46
SEPT	245	10	96	38.8	224	14	94	34.7	49
OCT	280	4	99	42.8	219	6	93	33.1	45
NOV	346	15	96	56.2	220	13	94	35.2	39
DEC	233	13	96	35.2	180	11	94	27.7	44
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	231	10	96	35.4	196	12	94	29.5	43

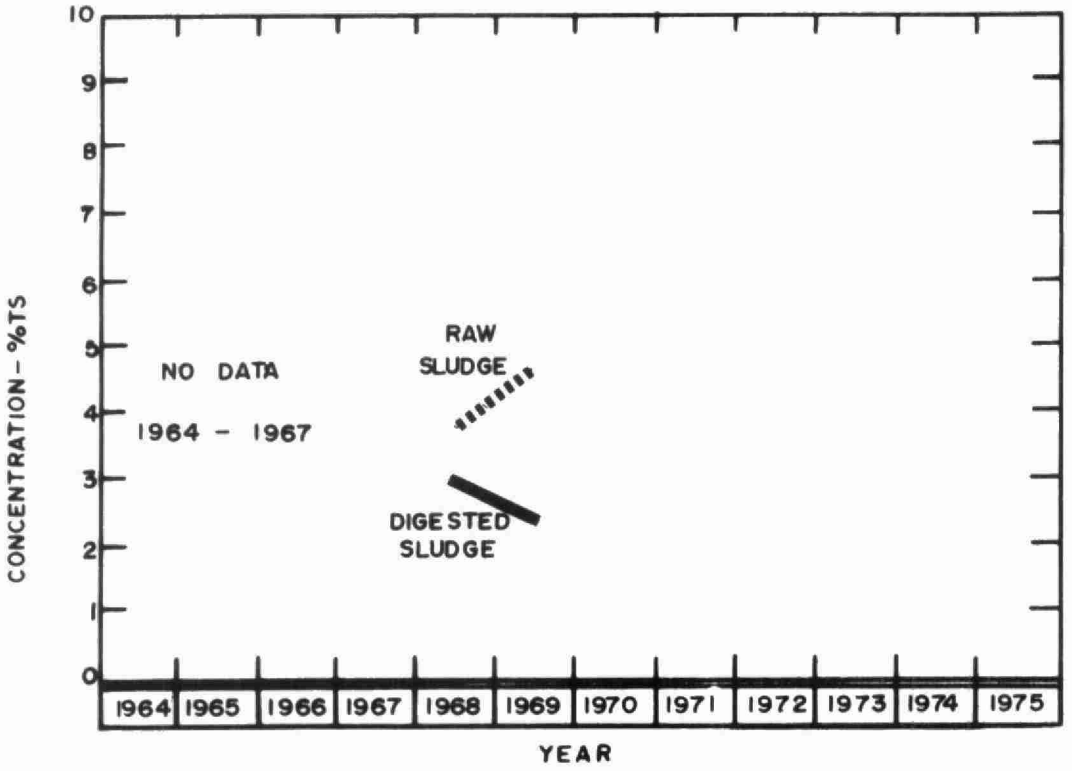
PLANT EFFICIENCY

NEW PLANT (No. 2)

MONTH	BIOCHEMICAL OXYGEN DEMAND				SUSPENDED SOLIDS				GRIT REMOVAL
	INF.	EFF.	REDUCTION		INF. CONCN	EFF. CONCN	REDUCTION		
	mg/l	mg/l	%	10^3 pounds	mg/l	mg/l	%	10^3 pounds	cu ft
JAN	155	14	91	72.6	152	12	92	72.0	37
FEB	237	34	86	100.3	179	28	84	74.6	34
MAR	385	16	96	158.1	170	20	88	64.7	44
APR	243	12	95	112.8	192	19	90	84.5	47
MAY	190	10	95	78.5	149	12	92	59.7	41
JUNE	170	5	97	61.8	164	8	95	58.4	57
JULY	223	3	99	77.0	195	2	99	67.6	29
AUG	170	12	93	52.9	154	6	96	49.6	46
SEPT	245	9	93	82.4	224	28	88	68.5	49
OCT	280	55	80	84.2	210	25	89	72.6	45
NOV	346	12	97	127.2	220	15	93	78.2	39
DEC	233	38	84	75.8	184	12	94	66.9	44
TOTAL	-	-	-	-	-	-	-	-	512
AVERAGE	229	18	92	86.5	194	16	92	72.8	43


COMBINED
VOLUME - 10^6 gal.
RAW SL.
DIGESTED SLUDGE
0
1
2
3
4
5
6
7
8
9
10
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
YEAR

DIGESTION


CONCENTRATION - %TS
NO DATA
1964 - 1967
RAW SLUDGE
DIGESTED SLUDGE
0
1
2
3
4
5
6
7
8
9
10
1964
1965
1966
1967
1968
1969
1970
1971
1972
1973
1974
1975
YEAR

COMBINED

SLUDGE DIGESTION and DISPOSAL

MONTH	RAW SLUDGE			DIGESTED SLUDGE			SUPERNATANT	
	VOLUME 10^5 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10^5 gal	TOTAL SOLIDS %	VOL SOLIDS %	VOLUME 10 gal	TOTAL SOLIDS %
JAN	1.6	5.0	70	.9	4.0	56	-	-
FEB	1.8	4.6	67	.5	2.1	53	-	-
MAR	2.4	4.5	76	.8	2.2	56	-	-
APR	2.4	-	-	1.3	2.5	59	-	-
MAY	2.9	4.9	-	1.3	2.0	48	-	-
JUNE	2.8	-	-	1.8	-	-	-	-
JULY	4.4	-	-	2.5	-	-	.10	-
AUG	3.4	-	-	2.1	-	-	.02	-
SEPT	3.7	-	-	2.1	-	-	-	-
OCT	3.5	-	-	1.6	1.8	58	.20	-
NOV	4.7	-	-	1.7	2.2	66	-	-
DEC	3.7	-	-	2.3	2.7	65	-	-
TOTAL	37.3	-	-	18.9	-	-	.32	-
AVERAGE	3.1	4.7	71	1.6	2.4	58	-	-

AERATION

OLD PLANT (No. 1)

MONTH	AVG DAILY FLOW mil gal	AERATION INF. BOD mg/l	AERATION INF. SS CONCN mg/l	SECONDY. EFF. BOD mg/l	SECONDY. EFF. SS CONCN mg/l	M L S S CONCN mg/l	F/M lb BOD / lb MLSS	AIR USED 1000 cu ft / lb BOD	WASTE SLUDGE 10^3 lb
JAN *									
FEB *									
MAR	.47	-	-	-	-	2860	0	0	1.4
APR	.50	190	131	10	16	3450	.11	2.74	7.2
MAY	.50	120	130	14	18	2350	.11	3.26	17.4
JUNE	.54	-	-	-	-	2870	0	0	17.0
JULY	.53	100	84	5	8	2277	.10	3.43	0
AUG	.50	-	-	-	-	2050	0	0	0
SEPT	.55	120	103	10	14	2131	.12	3.70	10.2
OCT	.50	160	125	4	6	2827	.12	4.42	0
NOV	.46	270	124	15	13	1989	.26	2.84	12.0
DEC	.51	320	116	13	11	1892	.35	2.20	9.8
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	.50	183	116	10	12	2470	.17	3.22	10.7

* Out of Operation

AERATION

NEW PLANT (No. 2)

MONTH	AVG DAILY FLOW mil gal	AERATION INF. BOD mg/l	AERATION INF. SS CONCN mg/l	SECONDY. EFF. BOD mg/l	SECONDY. EFF. SS CONCN mg/l	M L S S CONCN mg/l	F/M lb BOD / lb MLSS	AIR USED 1000 cu ft / lb BOD	WASTE SLUDGE 10^3 lb
JAN	1.66	142	124	14	12	2990	.20	3.39	18.6
FEB	1.76	172	153	34	28	2850	.27	2.96	10.4
MAR	1.38	337	147	16	20	3390	.35	3.04	36.4
APR	1.62	-	-	12	19	3430	-	-	14.1
MAY	1.41	190	100	10	12	2990	.24	5.12	12.1
JUNE	1.25	150	112	5	8	2480	.20	7.94	28.2
JULY	1.13	125	135	3	2	2220	.17	7.90	-
AUG	1.08	150	108	12	6	1790	.23	9.66	-
SEPT	1.16	180	170	9	28	2050	.27	7.26	35.8
OCT	1.20	260	170	55	25	1830	.44	5.38	19.9
NOV	1.27	380	184	12	15	2370	.53	2.55	25.1
DEC	1.25	300	136	38	12	1810	.54	4.25	33.9
TOTAL	-	-	-	-	-	-	-	-	-
AVERAGE	1.30	217	140	18	15	2520	.31	5.40	23.4

Water management in Ontario